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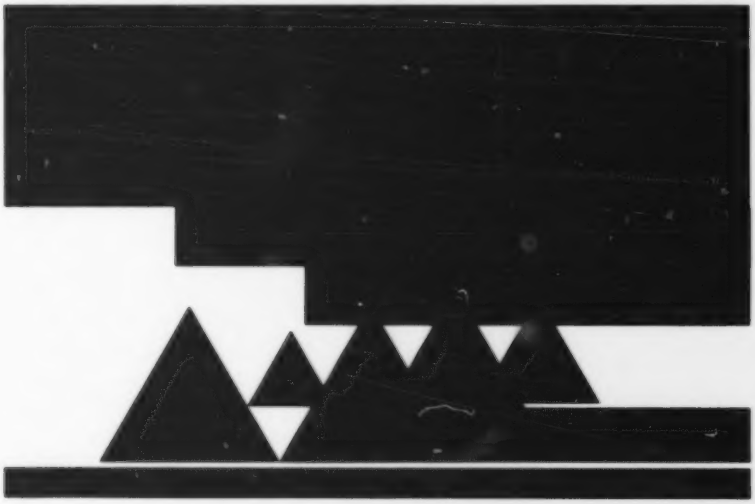
COLD LAKE - BEAVER RIVER



LONG TERM WATER MANAGEMENT PLAN

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COLD LAKE - BEAVER RIVER BASINS
COLD LAKE - BEAVER RIVER
WATER MANAGEMENT PLAN
SASKATCHEWAN
LINDBERGH
ELK POINT
BEAVER
RIVER

ALBERTA ENVIRONMENT
COLD LAKE-BEAVER RIVER
LONG TERM
WATER MANAGEMENT PLAN

Introduction

Environment Minister Hon. Fred Bradley announced adoption of a long-term plan for water resources management in the Cold Lake region in October 1985.

The long-term water management plan applies to the surface and groundwater resources in the Cold Lake and lower Beaver River basins. The lower Beaver River basin includes the following sub-basins: Marie Creek, Jackfish Creek, Manatokan Creek, Wolf River, Sand River, Mooselake River, Muriel Creek and Reita Creek. Implementation of the plan is expected to provide an adequate quantity and quality of water to meet the long-term domestic, municipal, industrial, agricultural, recreation, fisheries and wildlife requirements in the basins.

The water management plan is based on long-term industrial water supply to oil sands plants in the region by a privately owned and operated pipeline from the North Saskatchewan River. It replaces the short-term plan adopted in 1983, which met the withdrawal demands of users from local surface and groundwater sources.

Major Oil Sands Water Supply

1. When the consumptive use limits of the short-term plan are reached, and by 1991 at the latest, all major oil sands plant withdrawals (greater than 500 dam³/year) will be met from outside the Cold Lake and Lower Beaver River Basins from surface water supplied by a single source pipeline from the North Saskatchewan River.

During the water management study, three long-term water supply alternatives were evaluated: use of local sources, a reservoir on the Sand River and a pipeline importing water from outside the basin. On the basis of a technical evaluation and public review, the pipeline from the North Saskatchewan River was selected by the Alberta Government as the long-term source for the water requirements of oil sands plants.

In situ oil sands projects involve three stages of development: the initial testing and evaluation stage, the pilot plant or commercial development stage and the full commercial production stage. A decision on the viability of commercial production from the oil sands reservoir is usually not made until after the initial testing and evaluation stage. The water needs for this stage are usually small in quantity (less than 500 dam³/year) and short-term in duration. To avoid expenditures on supply works which may be costly and subsequently abandoned, oil sands users will not be required to convert to the pipeline until a decision is made to proceed to commercial development and water requirements exceed 500 dam³/year. Individual water needs of phases or plants that are developed as part of one overall project will be combined in enforcing the 500 dam³/year limit for conversion to the pipeline.

The short-term water management plan, adopted in March 1983, set out consumptive withdrawal limits for local surface water and groundwater sources. Based on the water requirements of projects, either approved or proposed at the time of adoption of this plan, and assuming no significant changes in recovery technology, local shortages necessitating implementation of a long-term supply are currently anticipated to occur as early as 1988 and by 1991 at the latest.

2. The North Saskatchewan River Pipeline will be a closed system. No surface discharge of water to natural water bodies will be allowed.

The water management study concluded that measures should be taken to prevent the transfer of fish species and organisms by the pipeline into the Beaver River surface waters. The study found fish species, disease - producing agents and parasites in the North Saskatchewan River system that have not been detected to date in the Beaver River system. Although these species and organisms may in fact be present in the Beaver River, the consequence of transferring them is unknown at this time. As a result, the possibility of transfer through a pipeline break, storage reservoir seepage or oil sands plant wastewater discharge was examined. The study concluded that the risk of transfer was extremely remote if the water passed directly from the

North Saskatchewan River by a pipeline and surface storage reservoir system to the steam injection facilities.

3. **Industry is expected to jointly fund, own and operate the pipeline system in accordance with existing provincial statutes and regulations. Alberta Environment will ensure that the form of pipeline ownership and operation selected by oil sands water users meets the long-term needs of all users and is consistent with the intent of the long-term water management plan through approvals for the pipeline and/or individual water allocations under the Water Resources Act.**

It is not the intent of Alberta Environment to direct industry on selection of an ownership and operation option or how the selected option should be implemented. Nevertheless, consistent with its mandate to manage the province's water resources, Alberta Environment has an interest in ensuring that the selected option will meet the long-term needs of users and is consistent with the intent of the long-term water management plan. In addition, Alberta Environment has an interest in ensuring that the fresh water allocations to individual users are appropriate, given their total water requirements and recycle ability.

4. **All oil sands users with withdrawals from local surface water and groundwater sources in excess of 500 dam³/year at the time of completion of the pipeline must discontinue these withdrawals within 1 year, except where a longer period is expressly set out in the conditions of an existing authorization, and convert the entire source of supply to the North Saskatchewan River pipeline. Users reaching the 500 dam³/year limit after the pipeline is operational must convert their entire supply at the time they exceed the limit.**

Consistent with the publicly reviewed concepts of long-term supply via the pipeline, oil sands industrial users with withdrawals greater than 500 dam³/year will be given a maximum of one year from time of completion of the pipeline, to discontinue use from their local surface water or groundwater source. The one year period will not apply to existing projects for that portion of water supply which has been allocated with conditions in the authorization clearly allowing a longer period to convert to the pipeline.

New oil sands water users will be expected to make necessary arrangements with the pipeline owner/operator to meet all of their water needs from the pipeline once requirements exceed 500 dam³/year.

Municipal, Agricultural, Industrial and Minor Oil Sands Water Supply

5. All municipal, agricultural, non-oil sands industrial and minor oil sands industrial withdrawals are expected to be met from within the Cold Lake and Lower Beaver River Basins using local surface water and groundwater sources as follows:

(A) Surface water withdrawals will be limited to the Beaver River and the following lakes with maximum net depletion use from each as indicated:

Maximum Available Net Depletion (dam^3/year)

Lake	Natural Outlet	Controlled Outlet
Cold	20,000	Not applicable
Wolf	850	6,300
Moose	Not applicable	3,000
Burnt	250	1,000[1]
Angling	190	900
Caribou	4,500	6,300
Ethel	Not applicable	700
Marie	425	1,200

River	Amount
Beaver	2,000[2]

1 Available withdrawal will be less if other withdrawals are taken from the Marie Creek system.

2 Annual available withdrawal will be subject to a monthly limit required to maintain preferred instream flows for fisheries, wildlife, recreation and water quality.

(B) Surface water withdrawals may be allowed from other lakes subject to detailed studies to demonstrate that preferred lake levels and downstream flows will be maintained.

(C) Continuous groundwater withdrawals from the surficial aquifers, bedrock channel aquifers, and bedrock aquifer will be allowed on a site specific basis within a maximum use limit.

(D) Groundwater and/or surface water withdrawals will be allowed on a site specific basis to supply a contingency or temporary demand by using such measures as storage and conjunctive use of surface water and groundwater.

The water management study determined the net depletions that are permissible from individual lakes while maintaining acceptable downstream flows and lake levels for fisheries, wildlife and recreation. The net depletions for controlled outlets are the amounts available provided a control structure is constructed at the lake outlet in accordance with the design criteria established during the study.

Exploration and analysis of groundwater data has shown that substantially more groundwater than the 4000 dam^3/year amount established in the short-term plan can be safely withdrawn from the bedrock channel aquifers. Additional amounts of groundwater are available from surficial aquifiers and bedrock aquifers. A detailed groundwater analysis will be undertaken to establish withdrawal limits. Withdrawals will be permitted on a site specific basis within these limits.

6. Authorization for withdrawals from lakes will specify lake levels at which industrial withdrawals will be reduced or suspended.

The water management study determined the lake elevations at which lake withdrawals should be reduced or suspended to ensure that lake levels and downstream flow requirements for domestic and municipal use, fisheries, wildlife and recreation are not violated. These elevations are included in the appendix for several of the eight lakes designated for withdrawals. The remainder of the lakes have limited recorded data on surface levels. The levels for these lakes will be specified at the time of an application for withdrawal so that additional hydrologic information collected between the date of this study and the date of application can be analyzed in order to refine the minimum lake level criteria. The resumption of withdrawals would be allowed once the lake levels have risen above the minimum level.

The water management study determined that up to a 30 percent reduction in withdrawals for approximately 15 weeks and up to 100 percent suspension in withdrawals for approximately six weeks may be required in order to maintain lake levels and downstream flows during drought periods. The amount and duration of the reductions will increase as the total withdrawal amounts increase toward the maximum allowable.

Water Supply - General

7. Alberta Environment will maintain management control of all new and existing multipurpose lake outlet control works, either through direct ownership or strictly enforced permit/conditional licence conditions.

Outlet control structures will be required at the lakes designated for withdrawals if proposed withdrawals are greater than the natural outlet limits. In these cases the withdrawal water user may be required to undertake and fund land acquisition and structure construction, in accordance with design criteria and specifications provided by Alberta Environment. However, the control of structures to regulate water levels and flows cannot rest with individual withdrawal water users where other users (fisheries, wildlife and recreation) depend on specified lake levels and downstream flows being maintained. As a result, Alberta Environment will either assume direct ownership and maintenance of the structure or will require the withdrawal water user to maintain the structure through strictly enforced permit/conditional licence conditions. In either case, the withdrawal water user may be required to modify or remove the structure and reclaim the structure site when the source of supply is converted to the pipeline.

8. Approvals for oil sands withdrawals from local sources will be on a permit/conditional licence basis for a fixed duration and with an annual review to allow for adjustment in permit/conditional licence conditions if other water users are adversely affected or to ensure conversion to the North Saskatchewan River Pipeline.

Approvals for oil sands water withdrawals from local sources will be on a temporary basis with regular review. This approval procedure will allow for adjustment in permit/conditional licence conditions in the event that lake level or stream flow criteria are not being met or in the case of groundwater level decline restrictions. It will also ensure conversion of the source of water supply to the North Saskatchewan River pipeline when the withdrawal by oil sands users exceeds 500 dam^3/year and the pipeline is operative.

Water Quality

9. No surface discharge of in situ oil sands recovery or upgrading process wastewater will be allowed in the basin: these industrial waste effluents will be disposed to deep wells or treated and reused.

The Prairie Provinces Water Board (PPWB) has developed water quality guidelines for the Beaver River. Although the guidelines have not been

finalized and formally adopted by the PPWB, Alberta, as a member of the Board, is working towards their adoption. The guidelines allow for only a small variation from the average existing concentrations for most parameters. As a result, effluent discharges would be quite small and would have to be strictly controlled to ensure the guidelines were met. In recognition of public concerns about oil sands surface discharges and Alberta's commitment to meet the proposed guidelines, no surface discharge of wastewaters from either the in situ recovery process or the upgrading process will be allowed.

10. Alberta Environment will undertake detailed studies in order to establish the future limits on deep well disposal and to ensure that future industrial wastewater volumes disposed by deep well injection do not exceed these limits.

Wastewaters from the in situ recovery process are currently disposed by injection into deep wells. Approvals for deep well disposal are based on submission of adequate technical information to demonstrate that the receiving formation has sufficient capacity to accept the wastes and that there is no danger of possible migration to, or contamination of, potable groundwater and surface waters. Public concern has been expressed about the future cumulative impact of deep well disposal as injection rates increase with the growth in the oil sands projects in the area. Alberta Environment is currently funding studies through the Alberta Research Council to examine these future cumulative impacts and to determine limits on disposal rates and volumes. In the event the limits established are restrictive, Alberta Environment will require industry to undertake measures, such as reduction in waste discharges through recycle, to ensure these limits are not exceeded. The need for additional monitoring of deep well disposal will be evaluated following the current studies being undertaken by the Research Council.

11. Alberta Environment will continue to monitor water quality on the Beaver River in order to assess the impact of waste discharges on water quality and will work with the municipalities to ensure that wastewater discharges do not exceed allowable loadings established by the PPWB water quality guidelines.

Natural dissolved oxygen concentrations are extremely low in the Beaver River in the winter. These levels, and the concentrations of other water quality variables, may be adversely affected by increased waste discharges from municipalities, land use changes, etc. unless measures are taken to improve waste treatment or reduce the discharge as growth takes place in the basin.

General

12. No withdrawals will be allowed from May, Manatokan, Muriel, Reita and Tucker Lakes. These lakes will be managed for the purposes of conservation, fisheries, wildlife or recreation.

The water management study has determined that, because of fisheries, wildlife or recreation importance and their sensitivity to any water level or flow manipulations, the above noted lakes should not be considered for withdrawals. Emergency withdrawals may be allowed if it can be demonstrated that no other water sources are available.

13. Approvals for oil sands plants will require operators to maximize recycle of water.

Water is recovered with bitumen in the steam injection recovery process. Recycle of this water reduces the wastewater volumes disposed by deep well and reduces the raw water requirements. The experience of some companies indicates that a recycling standard of 100% reuse of the recovered water is feasible. It is recognized that the achievable rate may vary with location and oil sands formation depending upon the quantity and quality of the recovered water. It is also recognized that some phasing in of the recycle capacity may be required as operating experience, technical knowledge and plant size increase. In situ oil sands plants will be required to maximize recycle within these constraints.

14. Industrial and agricultural (irrigation) water users will be encouraged to use municipal or other effluent to reduce consumption on fresh water and to reduce the amount of effluent being discharged into the Beaver River system. Oil sands users will not be required to switch their source of supply to the North Saskatchewan River pipeline if they can meet their needs from effluent.

Water quality studies completed to date indicate that as population levels increase municipal waste loadings to the Beaver River may require additional treatment in order to meet Alberta's surface water quality objectives and the Prairie Provinces Water Board interim water quality guidelines for the Beaver River. Use of effluent by industry or for irrigation will reduce both consumption of fresh water and the waste loading to the Beaver River. Oil sands plants using effluent may be allowed a minor withdrawal (less than 500 dam^3/year) in addition to the use of effluent if it will assist in meeting water needs provided that efficient use is being made of the effluent.

15. Alberta Environment will ensure that a comprehensive groundwater, streamflow and lake level monitoring program is maintained for those ground and surface water sources affected by water withdrawals.

Groundwater levels, lake levels and streamflow must be closely monitored to ensure that level and flow criteria are being met and other water users are not being adversely affected. Any withdrawals by industry from local sources, whether interim until the long term plan is in place or a minor withdrawal allowed after construction of the pipeline, will be accompanied by a comprehensive monitoring program.

Appendix

Minimum lake elevations at which industrial withdrawals will be reduced or suspended

Lake	Elevation (ASL)
Cold	534.55
Ethel	540.72
Moose	532.60
Wolf	597.20